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13. ABSTRACT (Maximum 200 words)
THIS IS A PROGRESS REPORT ON AEROJET'S STUDIES OF EXPERIMENTS CURRENTLY UNDERWAY (E.G., PLANT GROWTH & DIMP & DCPD LYSIMETER TESTS). LYSIMETER TESTS ARE BEING PERFORMED WHICH PERMIT OBSERVATION OF THE MOBILITY OF WATER SOLUTIONS OF DIMP IN FIVE DIFFERENT TYPES OF SOILS. DISCUSSION BETWEEN NEW ENGLAND NUCLEAR CORP. RELATIVE TO CONCENTRATIONS METHODS OF TRAPPING, SHIPPING PROCEDURES & COSTS FROM SCINTILLATION COUNTING OF SAMPLES FROM THE DIMP & DCPD VERSUS SOIL COMPATIBILITY EXPERIMENTS WAS HELD. ALL FIVE SPECIES OF PLANTS FROM THE 1, 8 AND 20 PPM DIMP GROWTH TESTS HAVE BEEN HARVESTED.

14. SUBJECT TERMS
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AEROJET ORDNANCE AND MANUFACTURING COMPANY
9236 East Hall Road
Downey, California 90241

DETERMINATION OF DECONTAMINATION CRITERIA

DIMP AND DCPD (U)

Report No. 1953-01(17)MP

Contract DAMD-17-75-C-5069

to

U. S. ARMY, Ft. Detrick
Fredrick, Maryland 21701

FILE COPY

Prepared by: P. A. O'Donovan
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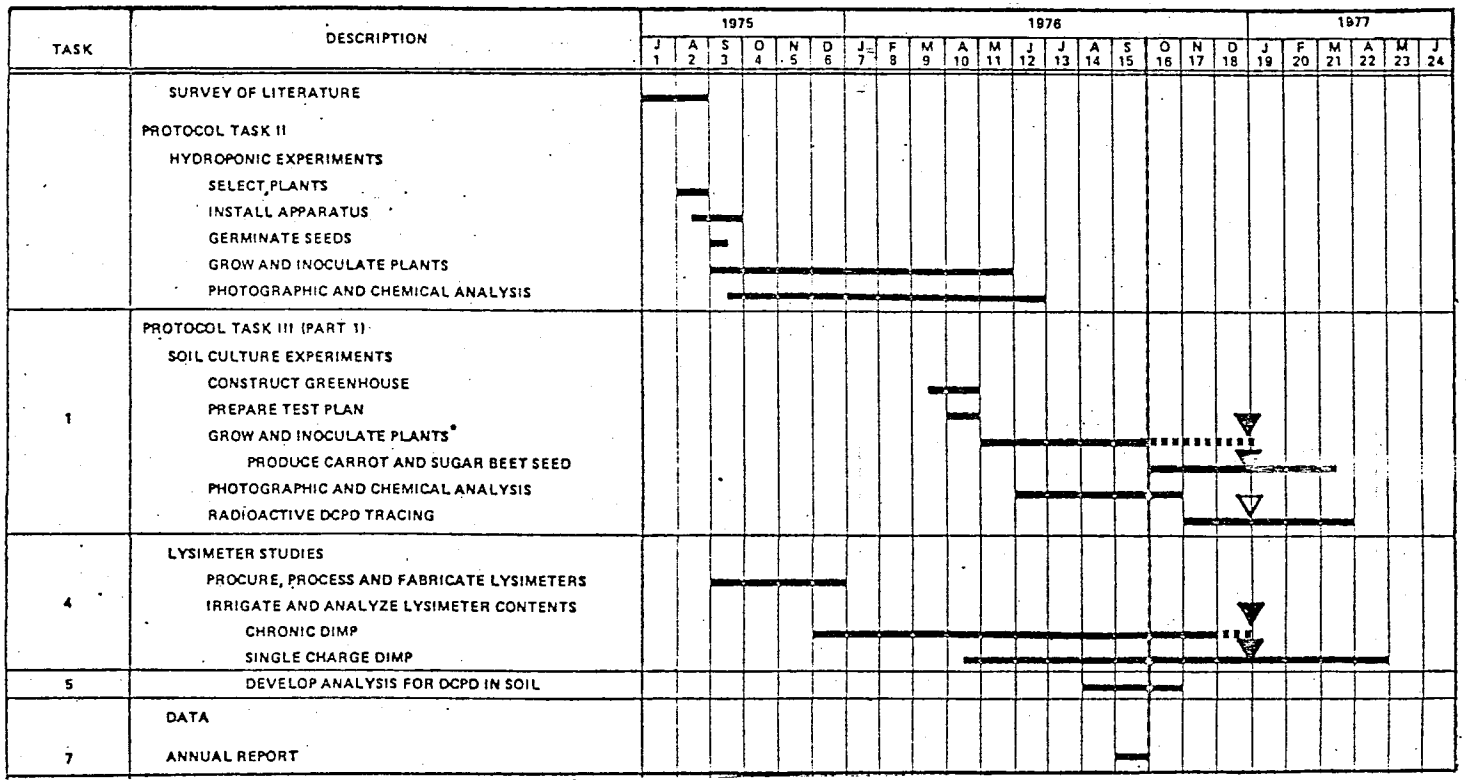

*POSSIBLE SLIPPAGE POINT. ADJUSTMENT OF CONTAMINANT AT THIS POINT SHIFTS ALL FOLLOWING PLANT WORK TO THE RIGHT.

▼ - Satisfactory Progress - on schedule

▽ - Slippage of schedule -
a. Reduction of level of effort caused postponement

Determination of Decontamination Criteria - DIMP and DCPD
Research Task Schedule

1953-01(17)MP

Progress on items proposed for action during December 1976, is discussed in the following paragraphs.

Full Scale Lysimeter Tests

Lysimeter tests are being performed which permit observation of the mobility of water solutions of DIMP (diisopropyl methyl phosphonate) in five different types of soils. These soils include:

Chino	-	sandy clay loam
Brawley	-	silty clay
Ventura	-	clay loam
Fullerton	-	sandy loam
Walnut	-	clay loam

The lysimeters each contain reconstructed soil profiles from the various sampling areas. This soil is contained in the lysimeters which consist of five foot deep steel cylinders, epoxy coated internally and fitted with an array of porous ceramic tensiometer samplers which are embedded in the soil at various depth intervals. These tensiometers allow sampling of the water percolating through the soil bed.

There are two lysimeters containing each type of soil. In one (Group 1) the soil is irrigated every two weeks with two inches (12,887 ml) of water containing 20 ppm (parts per million) DIMP. In the other, the top one foot depth of soil was intimately mixed with enough DIMP to result in a soil concentration of 20 ppm. This second type is irrigated with 2 inches (12,887 ml) of distilled water every two weeks.

Data on the movement of the chemical in the soil is produced by analysis of both the ground water from the tensiometers and soil cores taken down through the entire depth of the lysimeter and separated into 6-inch increments. Tables 1 and 2 and Figures 1 through 10 show the most recent soil data. The data in Figures 1 through 5 represent the soil DIMP content at three different time periods dating from the original DIMP inoculation of Group 2 lysimeters. They show that the DIMP made a relatively rapid initial movement into the soil and has since slowed but is still moving toward the bottom of the column. With the exception of Brawley, there is DIMP in the bottom 6-inch layers of all the soils.

Figures 6 through 10 show the same type of information for Group 1 lysimeters. These curves indicate that a portion of the DIMP in the standing water evaporates and/or is decomposed and the remainder is distributed throughout the soil with significant amounts draining out the bottom of the lysimeters. The water which penetrates the lysimeter bed is collected at the bottom (60 inches depth) measured and analyzed for DIMP.

The amount of water thus collected divided by the amount applied (12,887 ml) gives a figure termed drainage ratio. The chief mechanism of water loss in this system is evaporation. This is shown to be a significant quantity by the data represented in Figures 11, 12, and 13.

Table 1

DIMP Content of Soil Samples (ppm) (365 days)

Group 1

Depth	Ventura	Chino	Fullerton	Walnut	Brawley
0 (surface) *	41.8	33.4	15.3	*	1.4
0 - 6"	2.9	11.7	5.0	*	1.7
6 - 12"	2.2	6.2	6.6	*	2.3
12 - 18"	**	5.0	5.3	4.4	2.1
18 - 24"	**	4.4	4.8	5.5	3.6
24 - 30"	2.3	*	6.0	4.9	1.8
30 - 36"	0.8	*	8.2	4.4	1.0
36 - 42"	0.9	*	5.9	5.7	**
42 - 48"	2.1	*	6.6	5.4	**
48 - 54"	1.7	*	14.5	4.0	0.9
54 - 60"	2.0	*	23.4	5.0	4.6

* Data not available at present

** <0.1 ppm

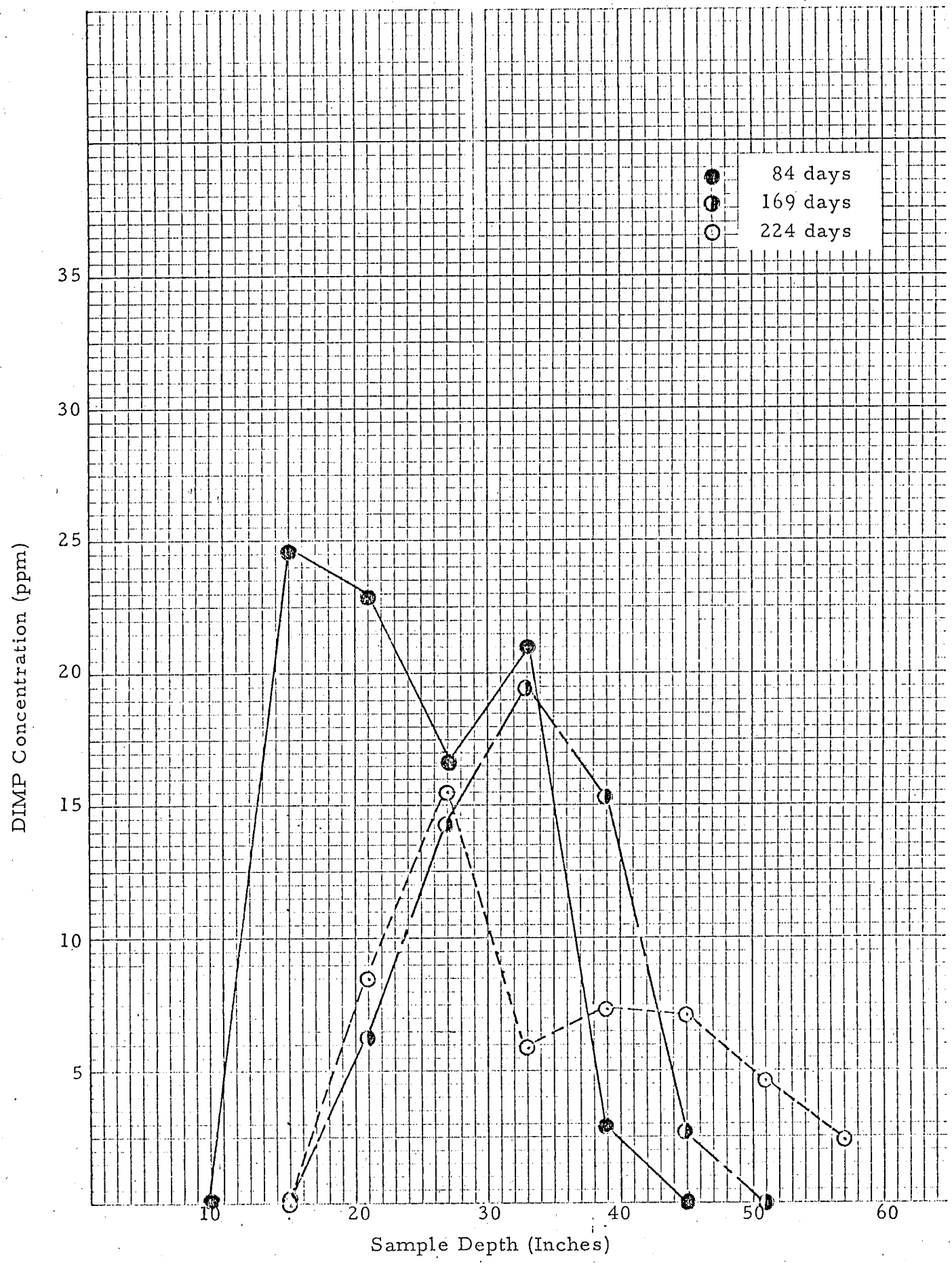

Figure 1. DIMP Content of Soil Samples, Chino, Group 2, Various Times

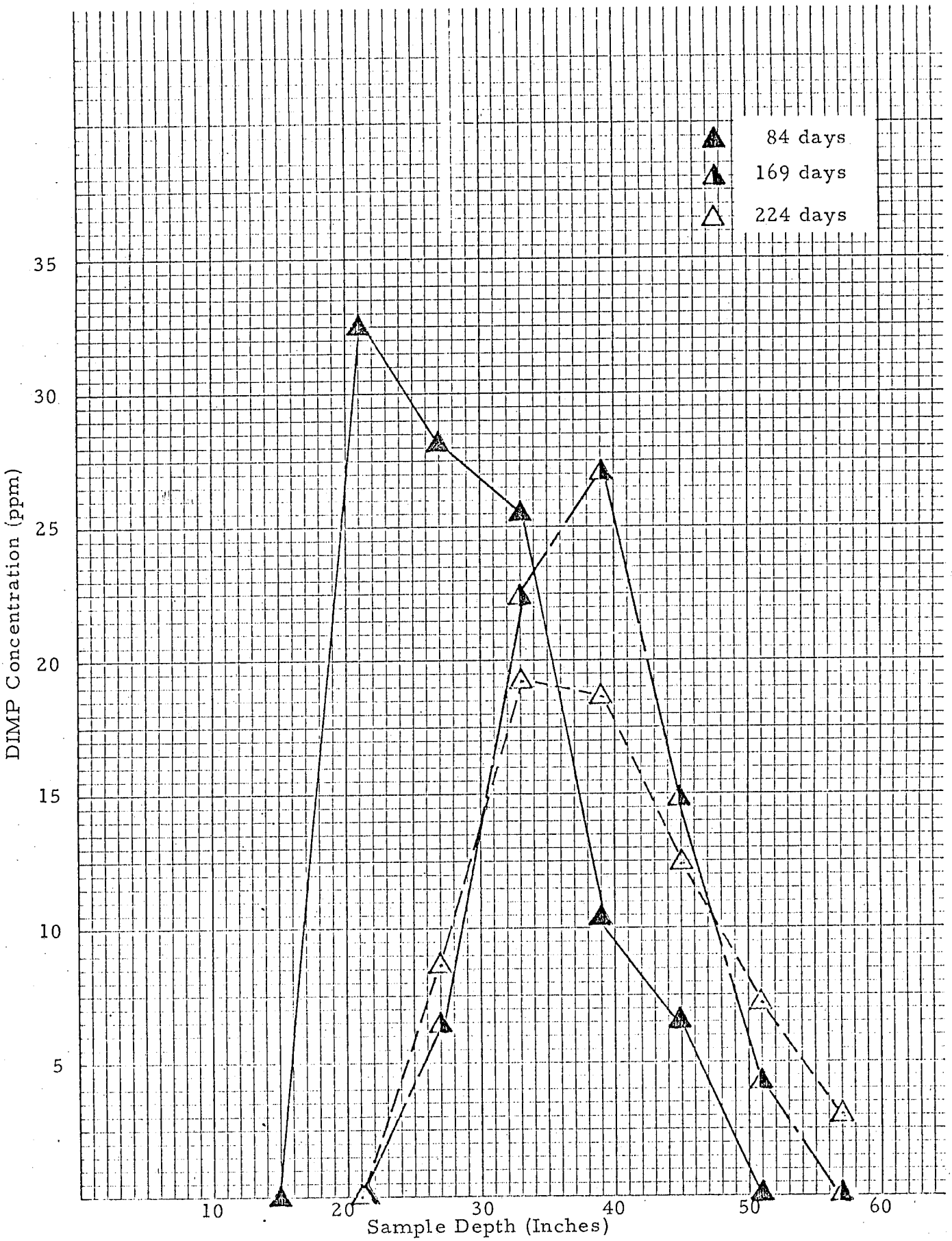

Figure 2. DIMP Content of Soil Samples, Ventura, Group 2, Various Times

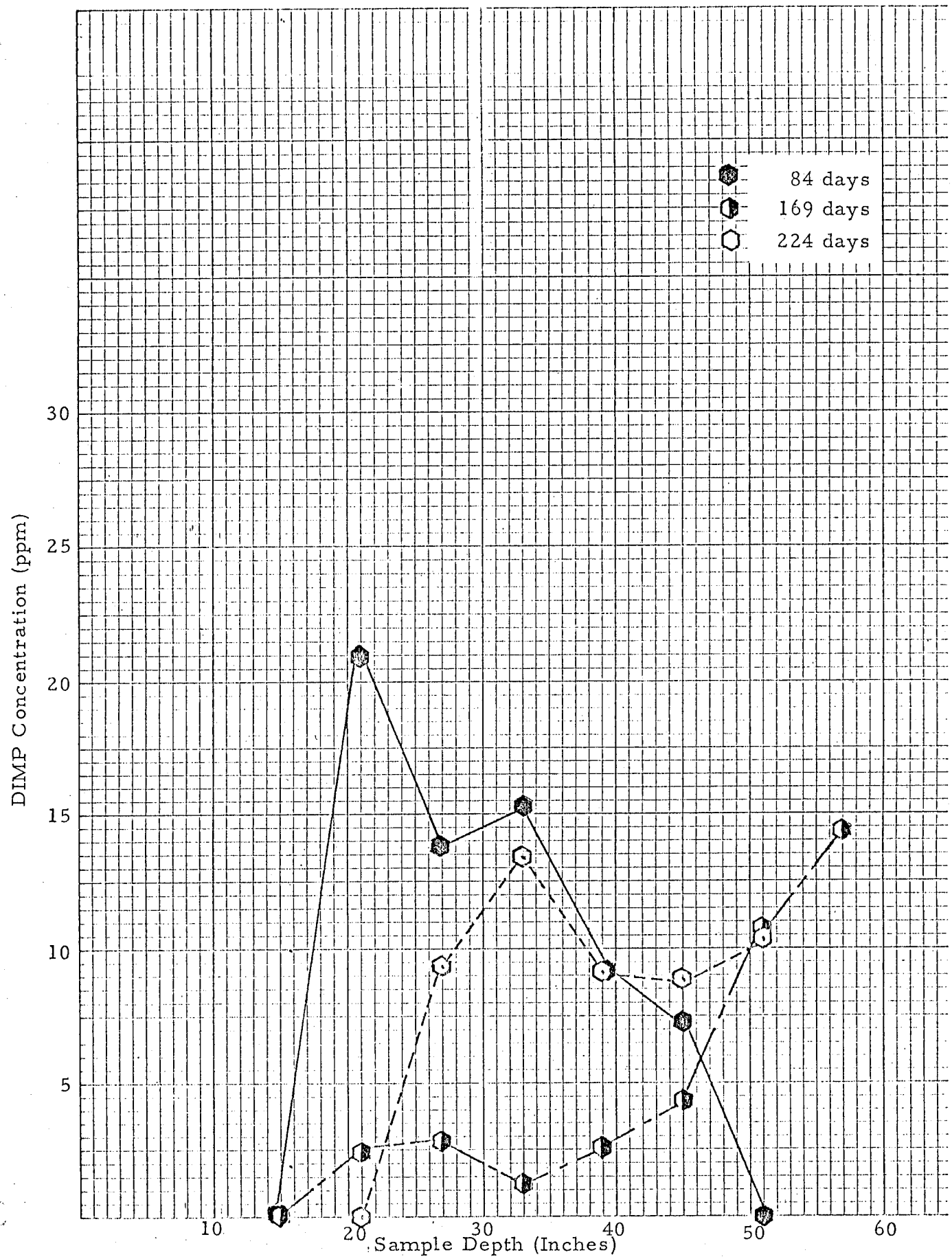

Figure 3. DIMP Content of Soil Samples, Fullerton, Group 2, Various Times

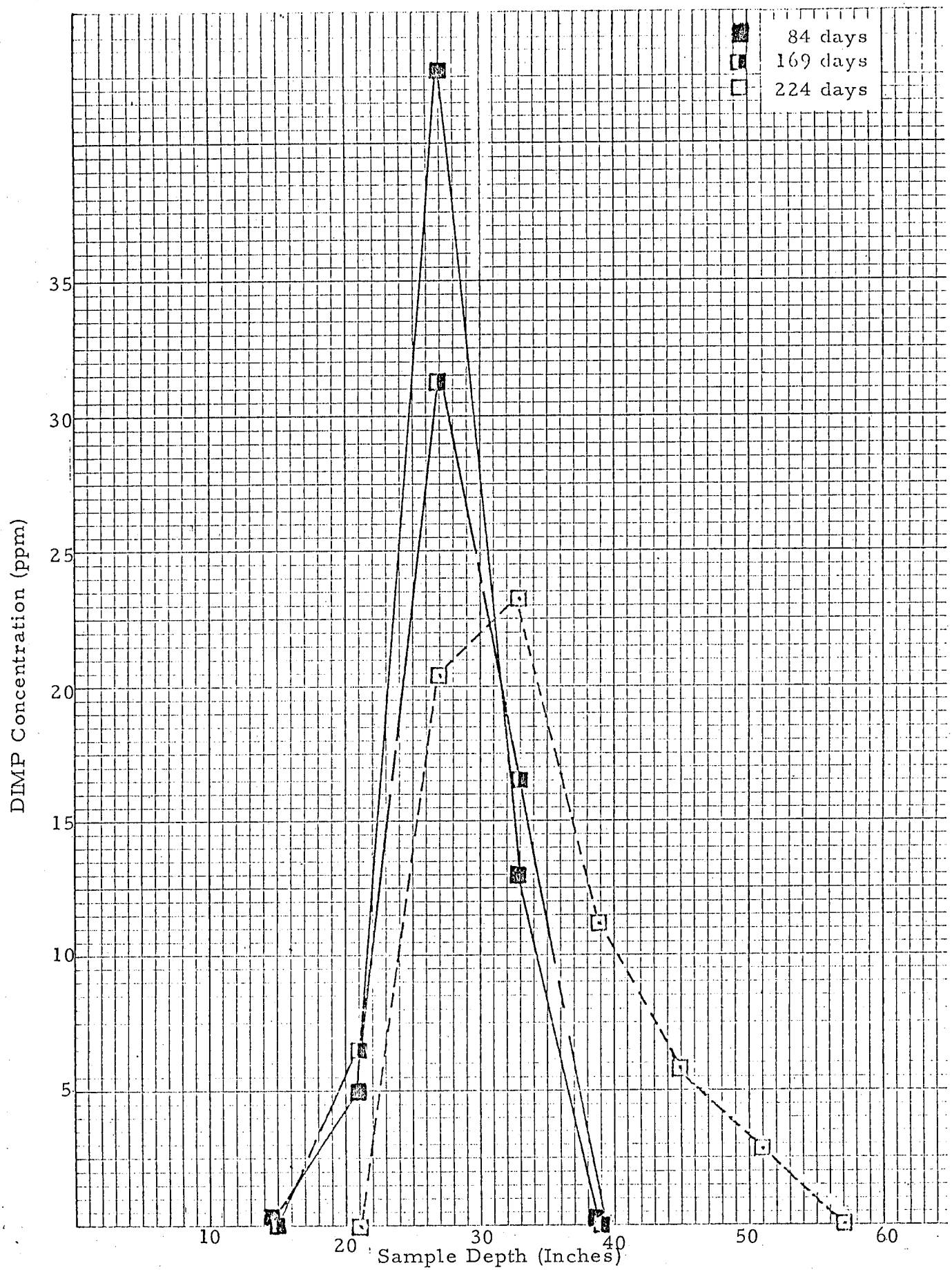

Figure 4. DIMP Content of Soil Samples, Brawley, Group 2, Various Times

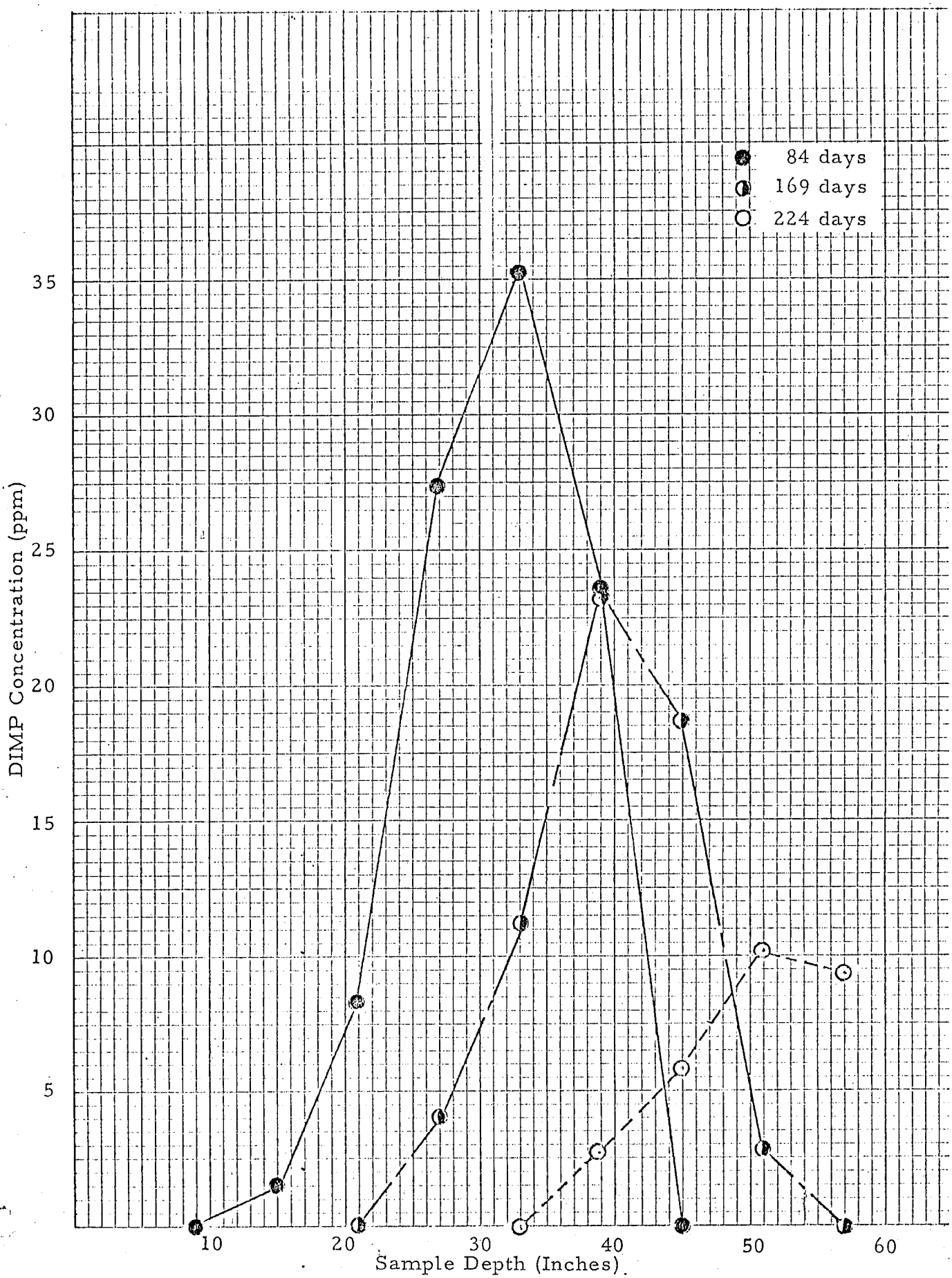

Figure 5. DIMP Content of Soil Samples, Walnut, Group 2, Various Times

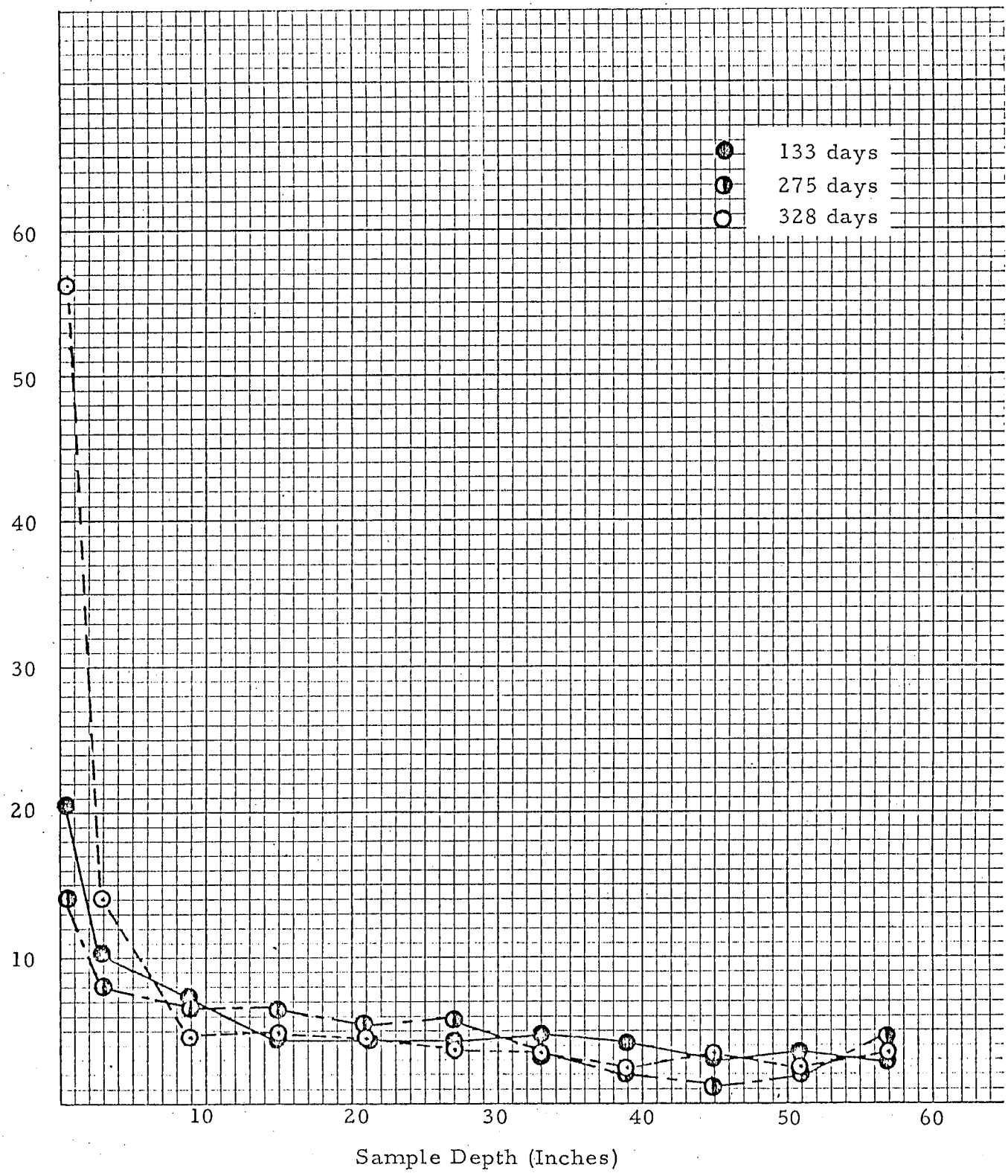

Figure 6. DIMP Concentration of Soil Samples, Chino, Group 1, Various Times

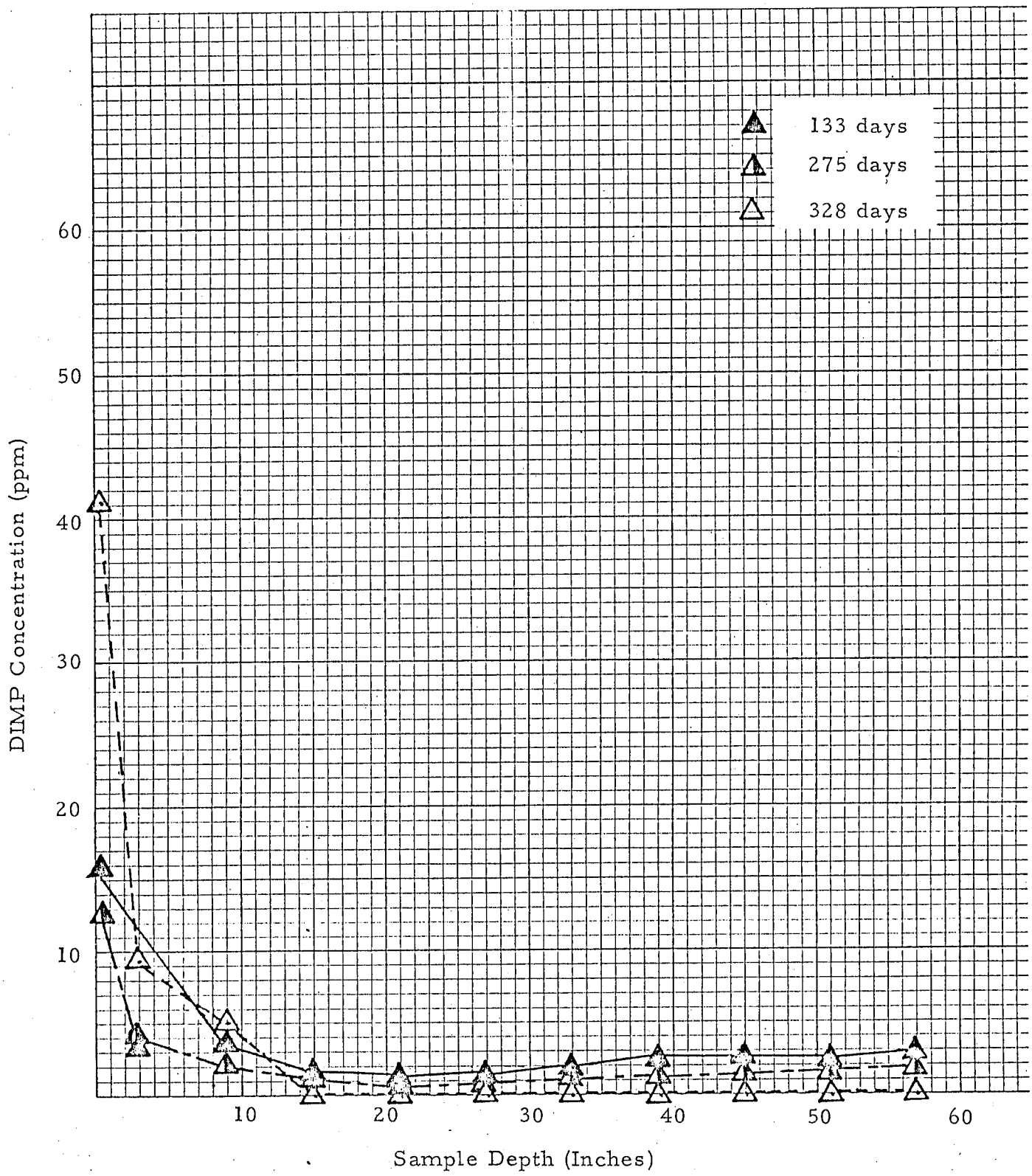

Figure 7. DIMP Concentration of Soil Samples, Ventura, Group 1, Various Times

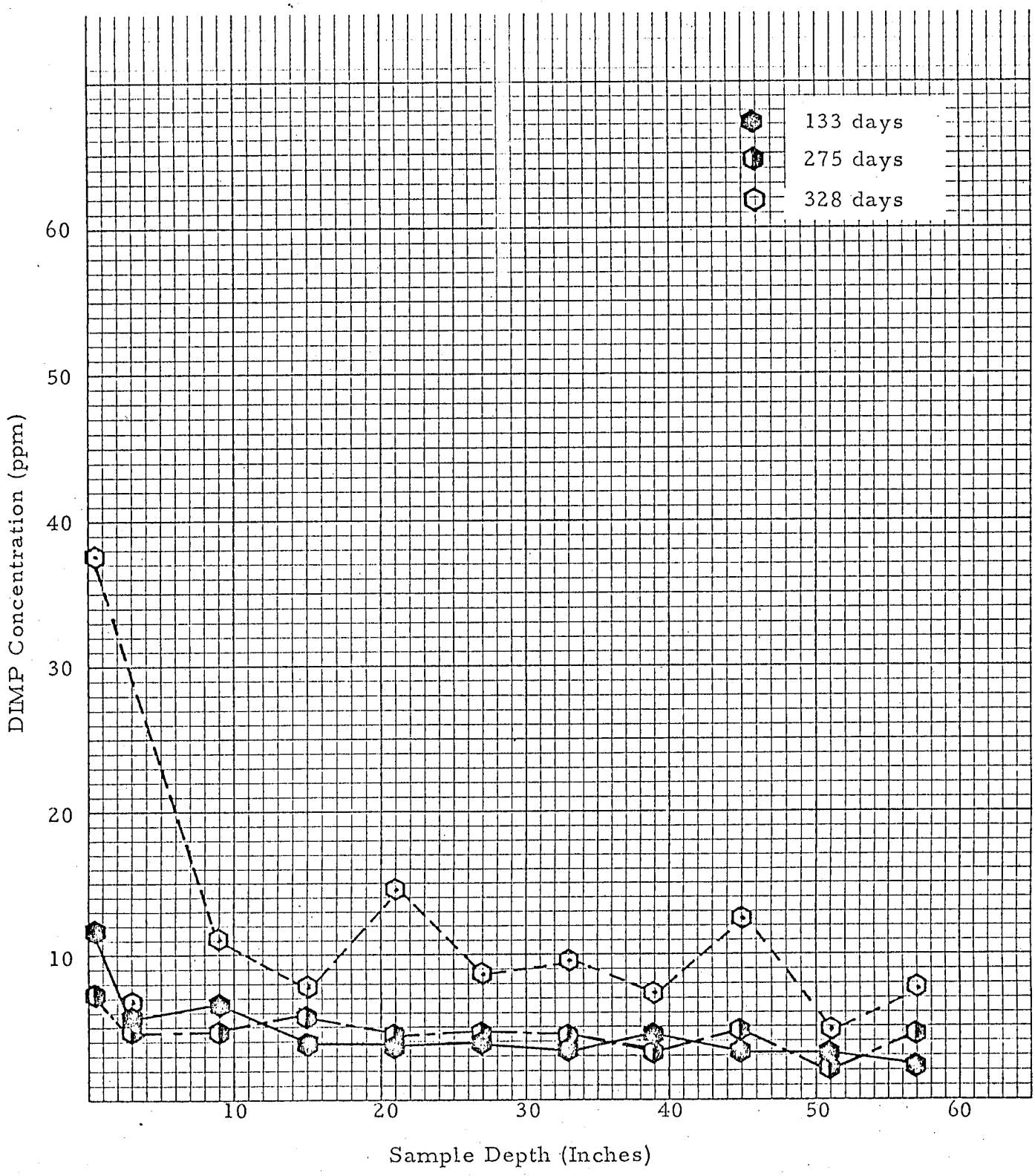

Figure 8. DIMP Concentration of Soil Samples, Fullerton, Group 1, Various Times

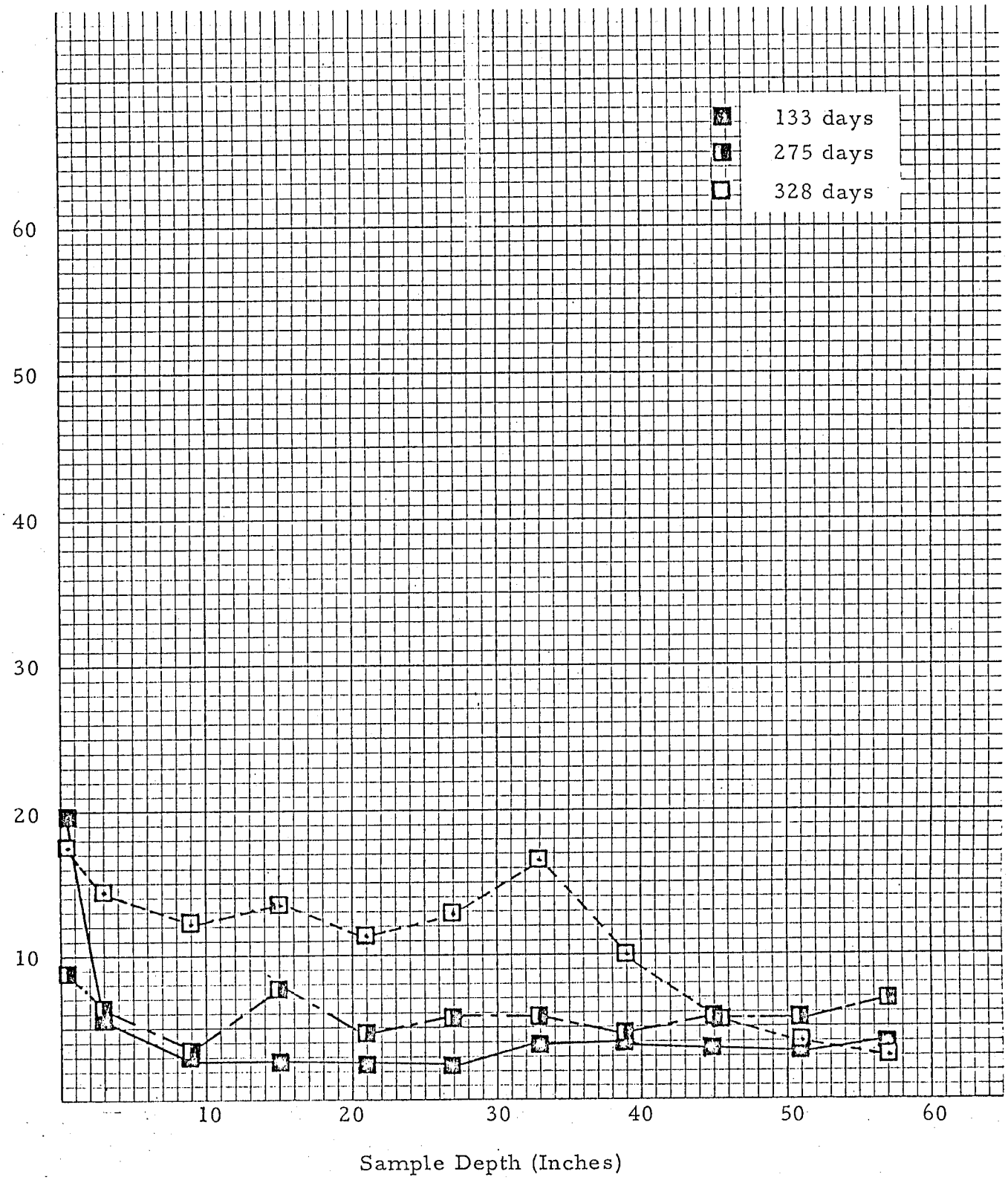

Figure 9. DIMP Concentration of Soil Samples, Brawley, Group 1, Various Times

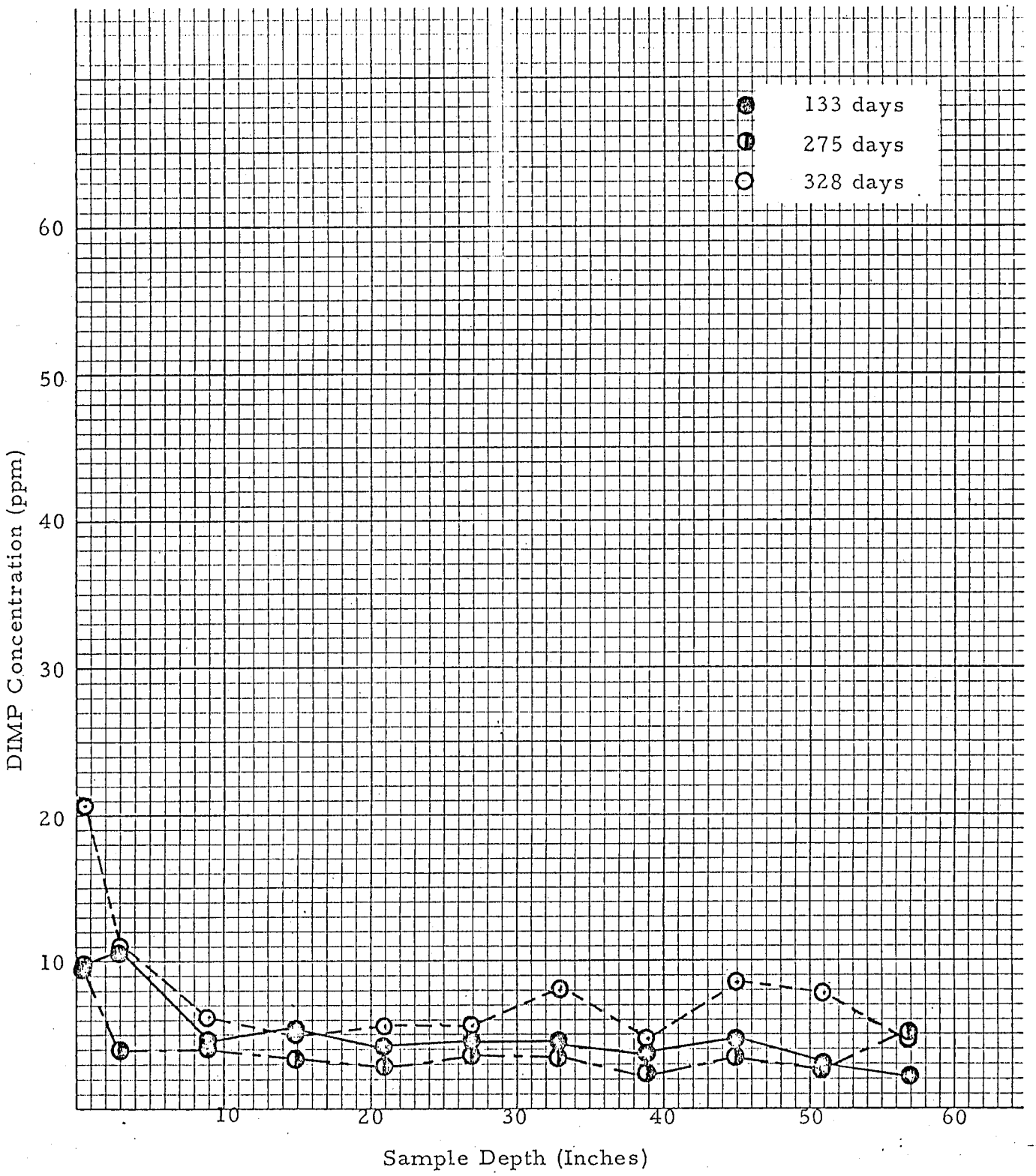

Figure 10. DIMP Content of Soil Samples, Walnut, Group 1, Various Times

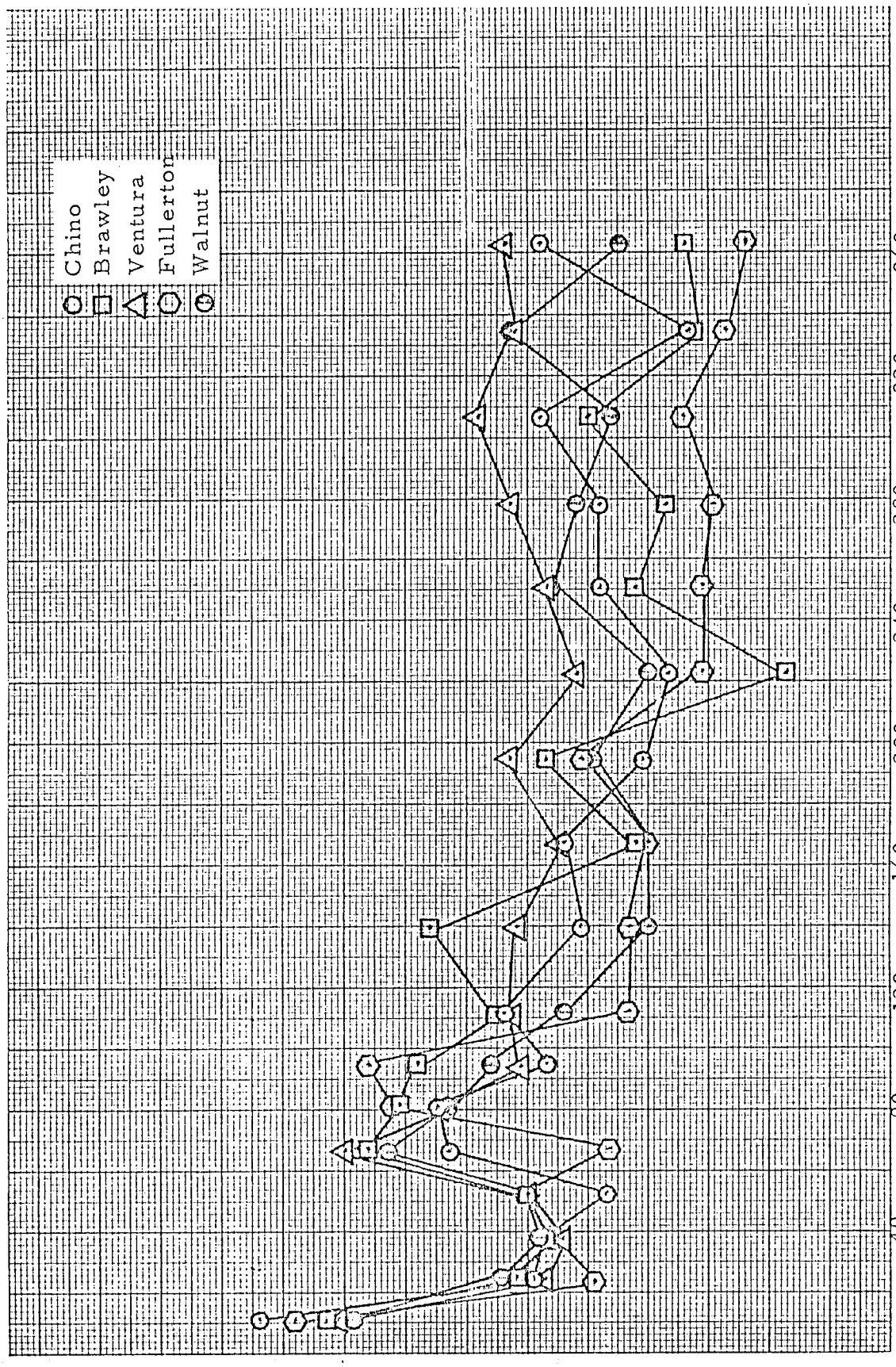

Figure 11. Drainage Ratios of Various Soils in Full Scale Lysimeter Group 1

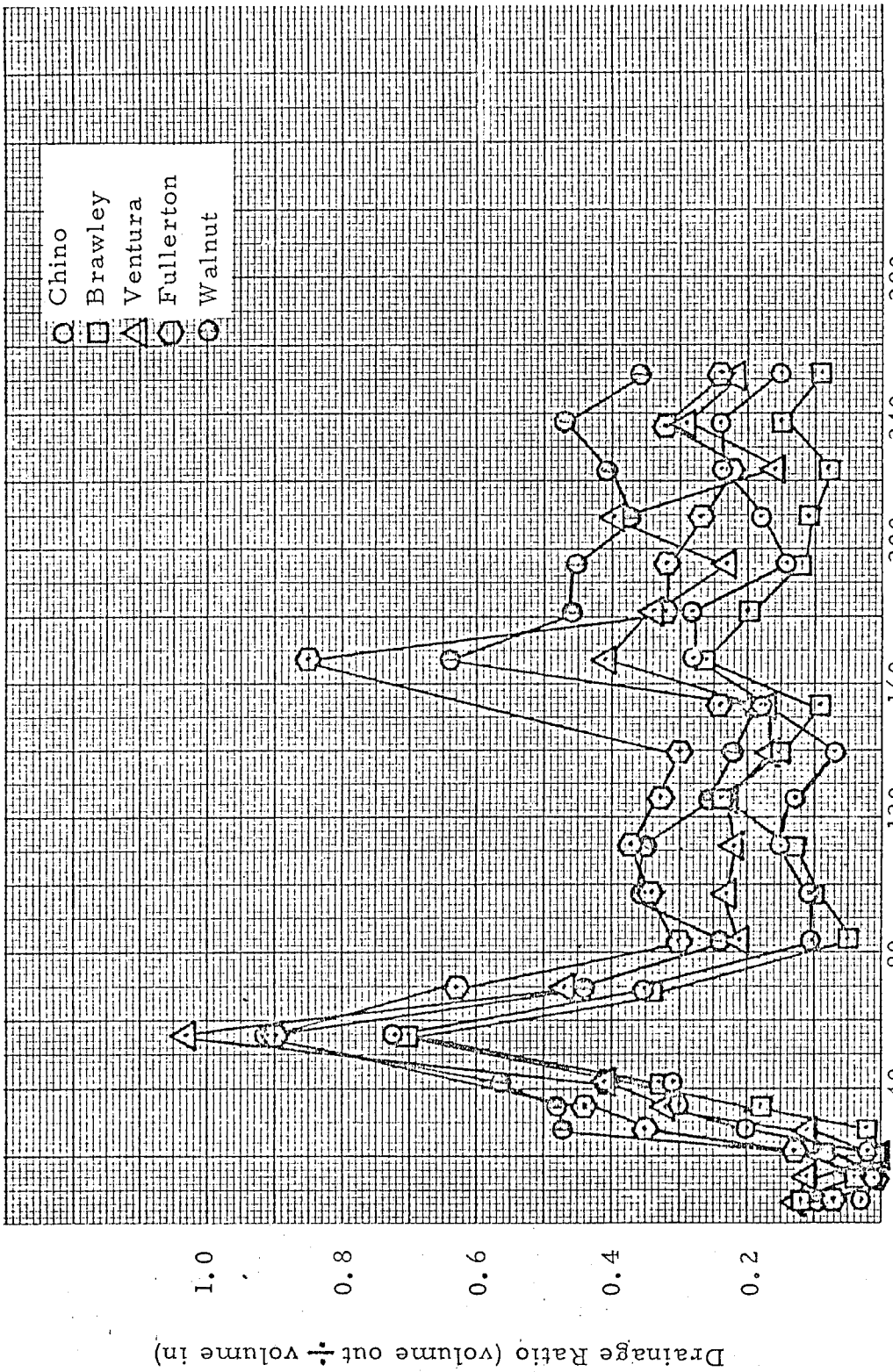

Figure 12. Drainage Ratios of Various Soils in Full Scale Lysimeters
Group 2

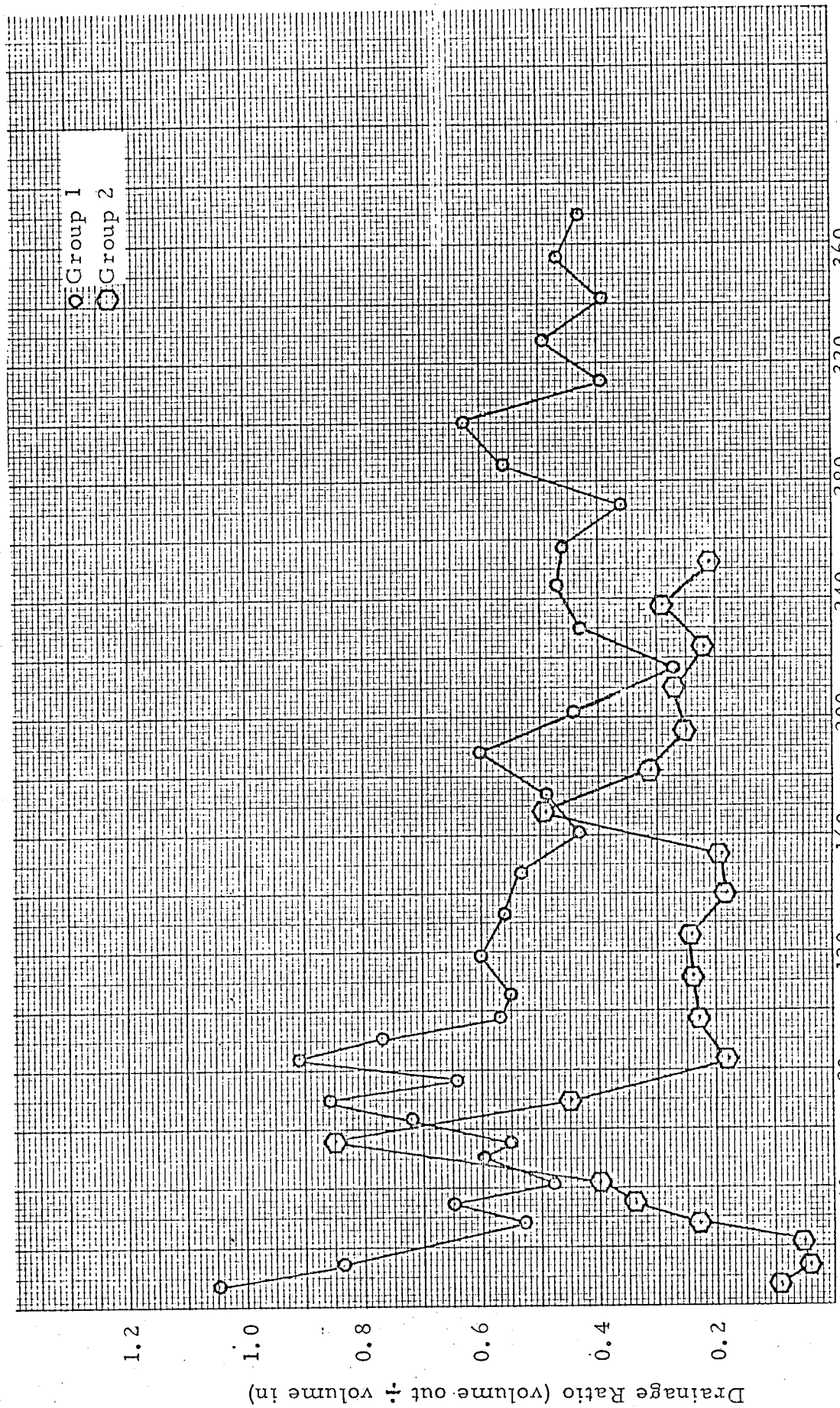

Figure 13. Drainage Ratios of Various Soils in Full Scale Lysimeters
Average of All Samples Within the Groups

The concentration of DIMP in the drainage water from the Group 1 samples has been plotted versus time in the past several monthly reports. These plots will not be repeated here since the most recent data has indicated no change in the established data trends.

Tables 3 and 4 show the latest available data for the DIMP content of tensiometer water samples. The data from Group 1-Fullerton and Brawley samples indicate somewhat higher DIMP content than recent trends would predict. The significance of such variations in the data will be evaluated at the conclusion of the irrigation tests. It is anticipated that multiple core samples will be taken and analyzed for determination of agent concentration in soil at that time.

Radioactive Tracing of Soil Contamination

Discussion between AOMC and New England Nuclear Corporation relative to concentrations, methods of trapping, shipping procedures and costs for scintillation counting of samples from the DIMP and DCPD versus soil compatibility experiments was held. Bench work on these experiments will be initiated during January.

Soil Culture Experiments

All five species of plants from the 1, 8, and 20 ppm DIMP growth tests have been harvested. These include alfalfa, wheat, bean, sugar beet, and carrot. The yield data is being prepared for presentation to the statistician for analysis.

The soil range finding series of growth tests is continuing. The carrot and sugar beet at the 50 ppm DIMP level are beginning to develop minimal leaf tip browning.

Table 3.

DIMP Content of Tensiometer Water Samples (Group 2 - West)

Depth	Ventura	Chino	Fullerton	Walnut	Brawley
		ppm @ 245 days			
6"	*	*	*	*	4.4
18"	**	12.3	*	*	12.7
30"	9.6	32.7	169.8	25.3	128.0
42"	200.0	21.7	60	50.9	14.5
54"	*	**	59.6	38.2	*
60"	*	*	49.8	23.9	*

* No sample

** < 0.1 ppm

Table 4.

DIMP Content of Tensiometer Water Samples (Group 1 - East)

Depth	Ventura	Chino	Fullerton	Walnut	Brawley
		ppm @ 365 days			
6"	**	16.9	36.4	10.2	34.8
18"	*	32.7	61.4	19.0	24.1
30"	5.4	20.3	73.6	25.7	51.5
42"	8.2	21.8	60.5	17.4	**
54"	11.4	16.5	19.6	28.4	12.3
60"	18.9	20.2	15.0	21.1	15.8

* No sample

** < 0.1 ppm

Proposed Activity for January 1977

- Harvest plants from the range finding soil growth experiments to determine effective dose levels of contaminants.
- Initiate radioactive DIMP and DCPD in soil evaporation/decomposition experiments.
- Run regression analyses on harvested plant yield data from growth tests terminated in December.
- Run ancillary analyses on soil and tissues from above growth tests.
- Continue treatment and analysis of lysimeter soil and water samples.